FACING UP TO GREENHOUSE GASES

By Maureen Keepin

Recognised as a worldwide problem a dramatic rise in greenhouse gases - in particular carbon dioxide – called for drastic action.

As a result, in December 2007 the 'Kyoto protocol' was signed by 174 countries with the objective of reducing greenhouse gas emissions. The aim was to encourage those undertaking polluting activities to become more efficient in their production processes through international exchange allowances for carbon dioxide (CO^2).

Put into place jointly with the Clean Development Mechanism (CDM), these negotiable allowances permit industrialised countries to benefit from carbon credits following investment in these cleaner technologies.

A carbon credit unit is generally taken as one tonne of greenhouse gas being equivalent to one tonne of CO^2.

Brian Robinson, Director of Seed Research at Rigby Taylor said: "This issue is not just about large industrial concerns as we all have a vital role to play in reducing greenhouse gases."

HOW THE CARBON CYCLE WORKS

Research demonstrates that man's activity contributes to an annual increase of 6,5 Petagrammes (Pg) of CO^2 per year, which equates to more than 6,000,000,000 tonnes.

Nature is a wonderful thing and around half the carbon produced is reabsorbed by the biosphere through increased photosynthesis and in the oceans by dissolution.

Problems arise because more than 3 Pg of CO^2 per year are not sequestrated– contributing to a substantial increase in greenhouse gases.

The carbon cycle is the biogeochemical cycle by which carbon is exchanged between the biosphere, rocks, oceans and the atmosphere. The cycle is made up of carbon sinks, where carbon is stocked, and fluctuates between them.

There are three types of cycle for carbon stocking:

- Short term e.g. the atmosphere, which renews its carbon every five years.
- Middle term e.g. humus in the soil or in a forest which can stock carbon for a few hundred years.
- Long term e.g. erosion of limestone rocks over more than 300 million years.

In a growing forest every one tonne of dry wood has the potential to stock 1.8 tonnes of CO^2 for several hundred years. However where trees decompose or the forest burns this carbon enters into the soil or the atmosphere as CO^2.

The earth's topsoil is a most valuable carbon sink as it stocks more carbon than all the earth's vegetation and atmosphere combined. The quantity of carbon stocked in the earth's soils is estimated at 1,600 Petagrammes.

This topsoil or humus is formed by the action of the decomposition of micro-fauna, fungi and bacteria into organic plant residues, which can stay in the soil for hundreds or even thousands of years.

And worldwide the most fertile soils are the chernozems found beneath natural grassland extending across Russia, the Ukraine and Canada.

Where the rapid mineralization of humus takes place losses can be in the order of 10 tonnes/per annum/per hectare in temperate climates and reach a few hundred tonnes in tropical areas.

Consequently even small changes of sequestration per square metre can produce significant changes to the global equilibrium of carbon.

WHAT IS THE GREENHOUSE EFFECT?

The greenhouse effect we hear so much about is a natural process that warms the atmosphere. It is caused by greenhouse gases in the atmosphere and is made up of:

- water vapour (55%)
- carbon dioxide CO^2 (39%)
- methane CH4 (2%)
- ozone (2%)
- nitrous oxides (2%)
- chlorofluorocarbons (CFC-11 and CFC-12)

Greenhouse gases absorb part of the sun's rays reflected from the surface of the earth (infra red) that cannot escape into space.

Importantly methane as CH4 is 21 times more effective as a greenhouse gas than CO^2.

So how does methane form? When an animal or a plant decomposes by fermentation or putrification in the absence of oxygen methane is produced.

Much of the methane present in the atmosphere is of a natural origin, including marshes. However important quantities are now also released from landfill sites and animal stock and these need to be curtailed.